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INT CL⁶ G08B 13/00 13/02 13/08 13/14

(54) **Security alarm device for a computer**

(57) The device comprises a control element (25) and connected thereto means for detecting movement of the computer (26), means for detecting tampering with the computer (27) and means for raising an alarm (29, 30). The control element (25) is arranged to raise an alarm if movement or tampering is detected. The tampering detecting means uses a microswitch to detect removal of the computer housing. The device is mounted on a printed circuit board fitted into an expansion slot of the computer.

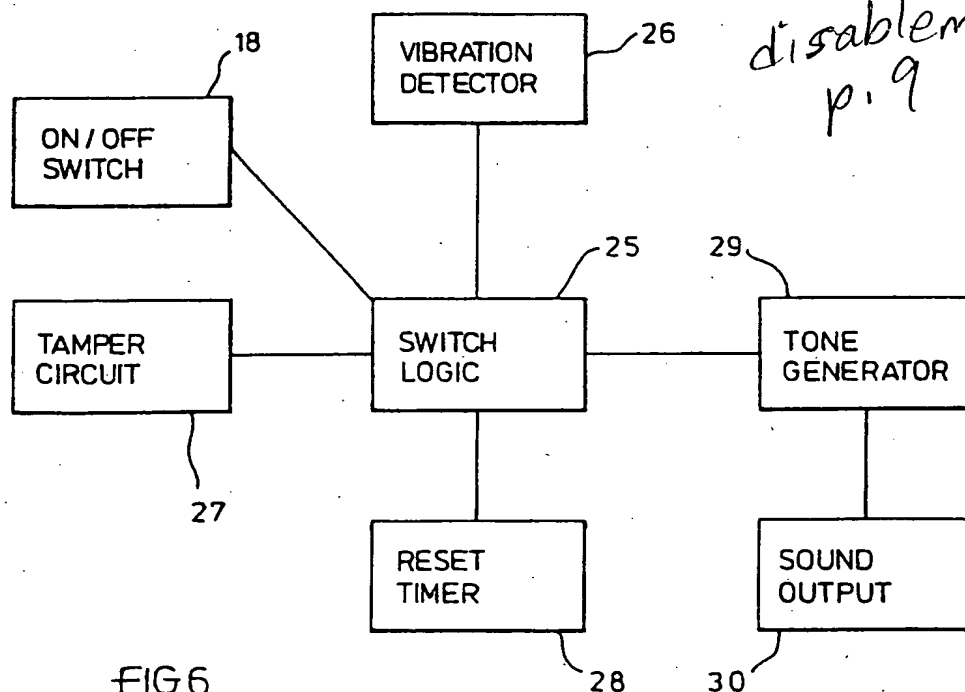
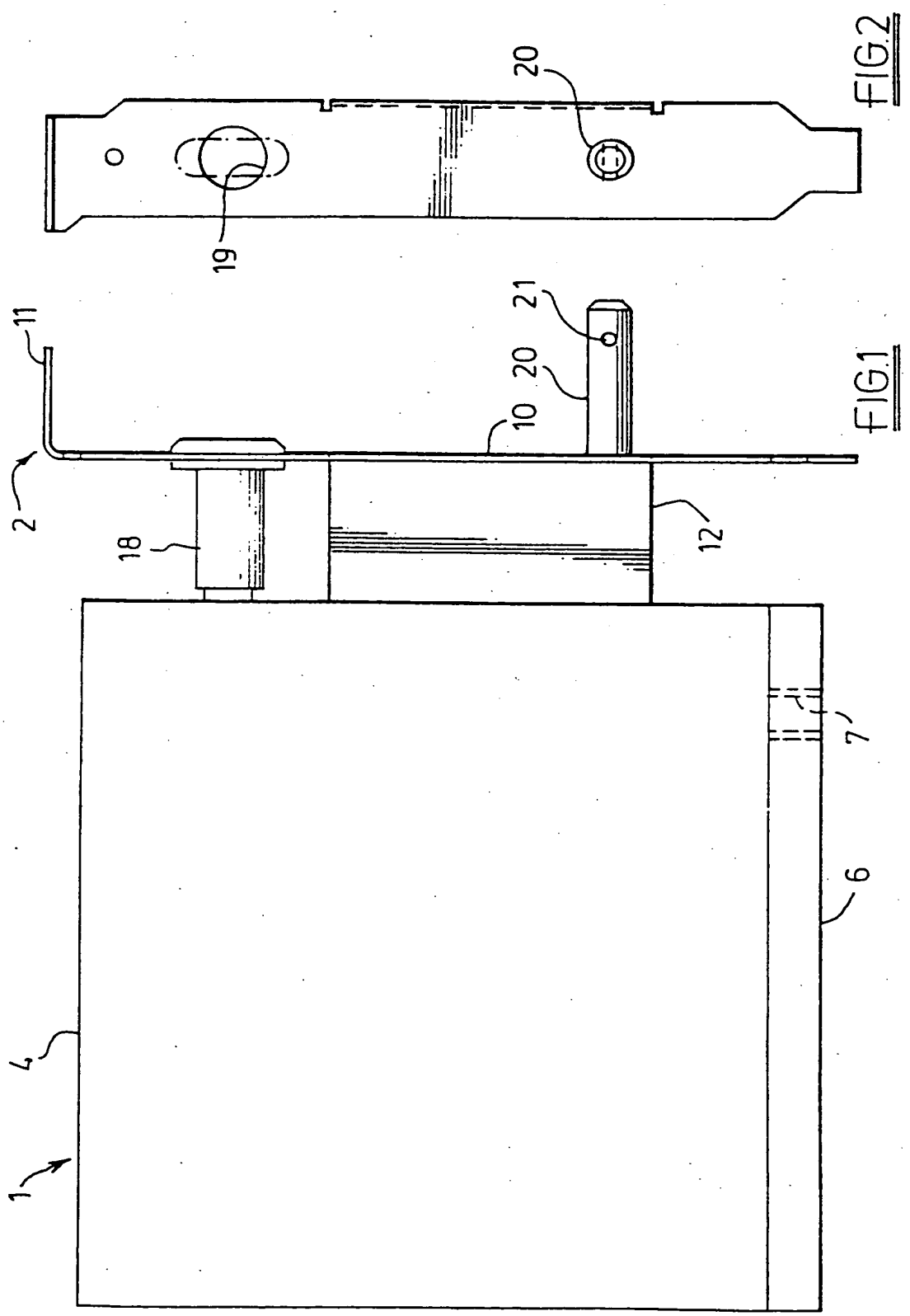
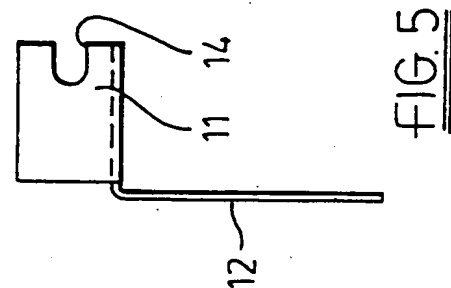
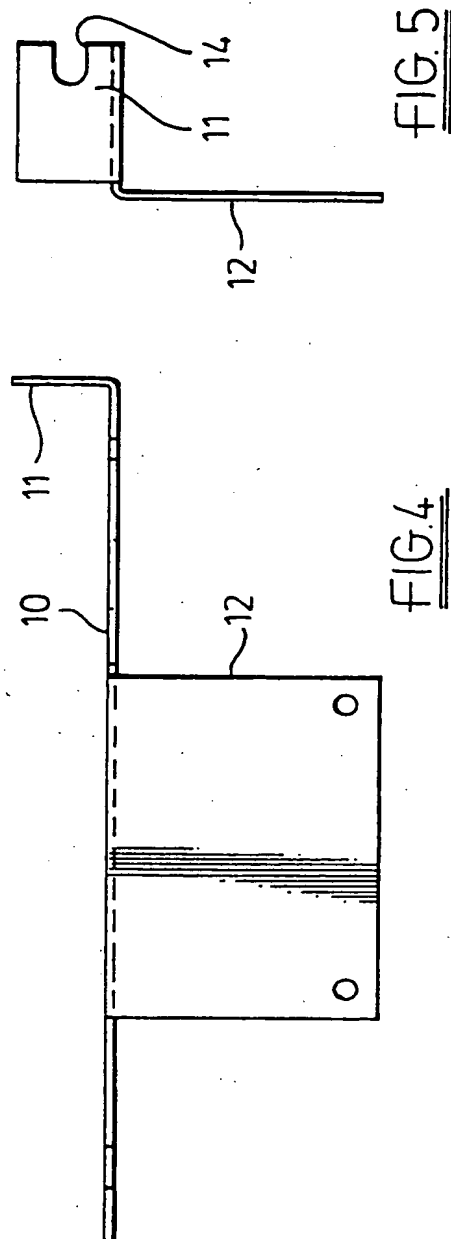
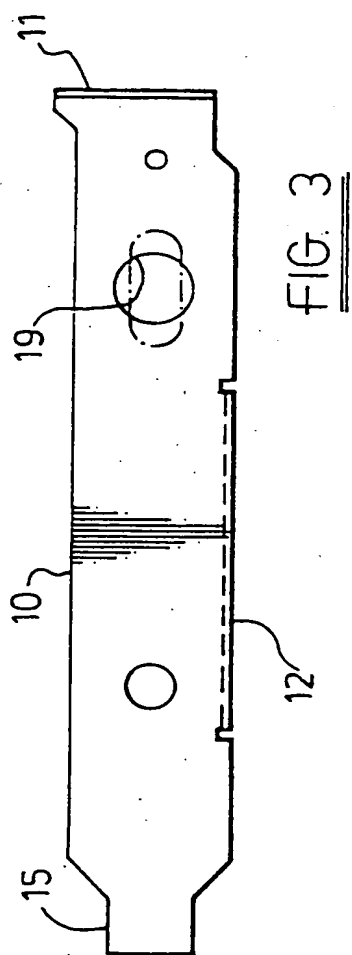
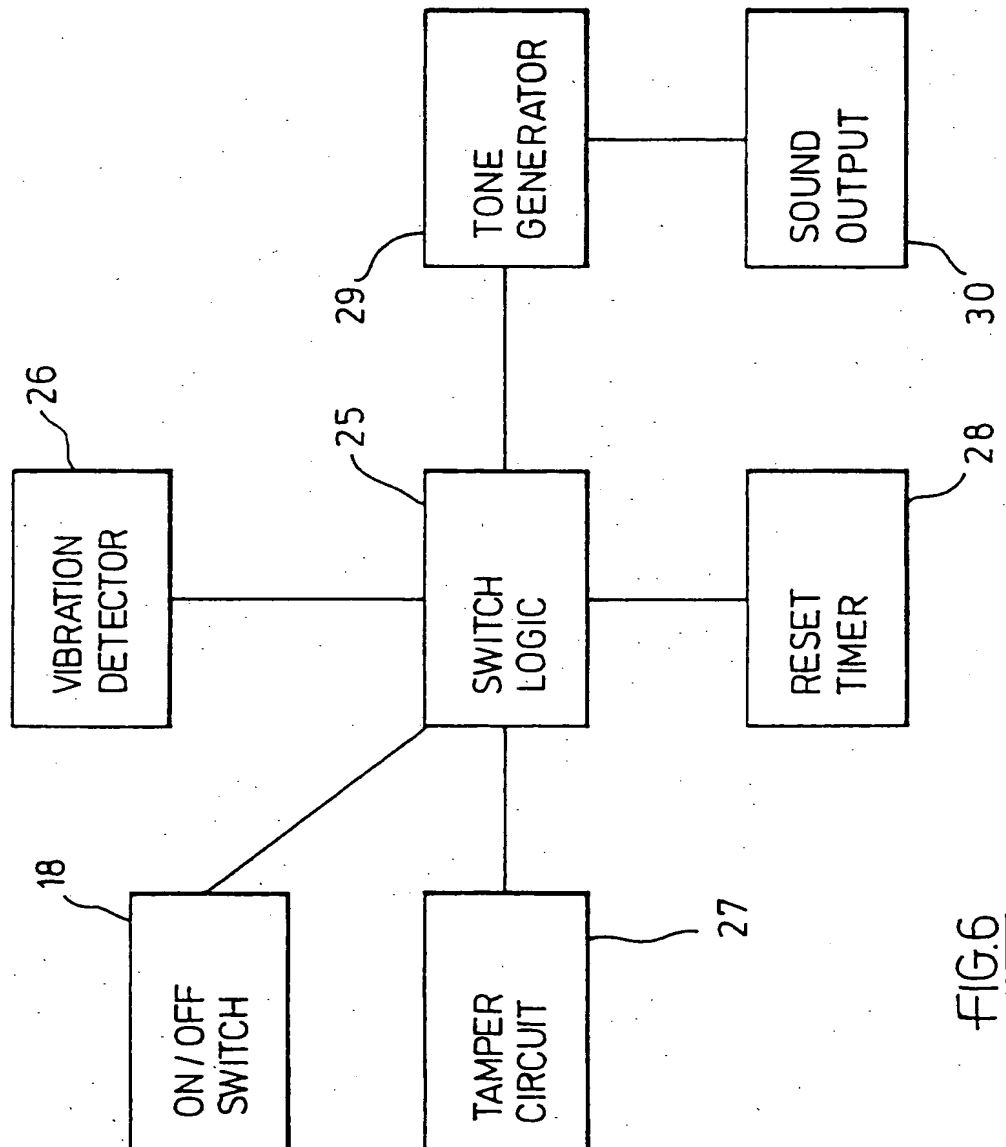


FIG.6

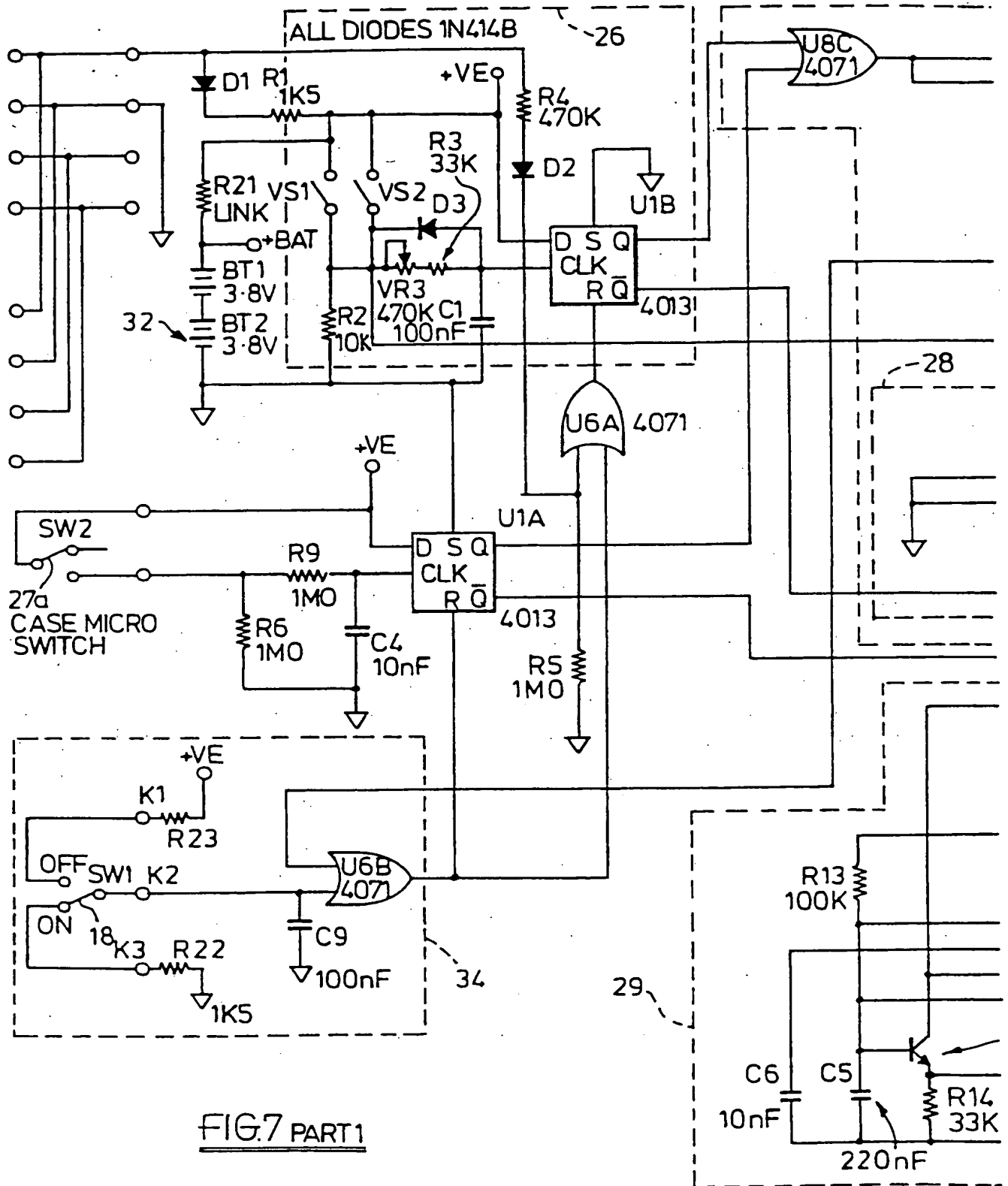
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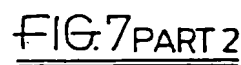




FIG. 6

4/5





SECURITY DEVICE FOR A COMPUTER

The present invention relates to a security device for a computer and also to a computer and a printed circuit board
5 for a computer that includes a security device.

Theft of computer equipment, and in particular of desktop computers, is a major concern both to businesses and to private individuals. Although complete computers are
10 sometimes stolen, an increasing problem is the theft of just the base unit, which contains the central processing unit (CPU) and hard disk drive (HDD), or just those components alone. The reason for this is that the base unit, and in particular the CPU and the HDD, are the most
15 valuable parts of the computer, they are easily removed and carried away without raising suspicion and they have a very high resale value.

Apart from the expense of replacing stolen computer
20 equipment, the inconvenience and damage to a business that can be caused by the loss of valuable data stored on the HDD is often incalculable.

Previous attempts have been made to deter thieves from
25 stealing computer equipment. One known method is to secure the computer to the desktop by a steel cable. However, the cable may be cut using a pair of bolt cutters or the HDD and the CPU may be removed without taking the rest of the computer.

30 In order to prevent the theft of internal components of the computer, it has been proposed to provide a cylinder of smoke that is released if the computer casing is removed by an unauthorised person. There is, however, a risk that the
35 sudden release of smoke may damage the computer, and also that the smoke may be released accidentally causing suffering to innocent parties.

There is, therefore, a need for a security device that

prevents or deters the theft either of a complete computer or the valuable internal components thereof. The security device should be capable of being built into one of the standard components of the computer, such as the motherboard, or supplied as accessory for installation in an existing computer.

According to the present invention there is provided a security device for a computer. The security device may include means for detecting movement of the computer, which may, for example, comprise one or more tilt sensors or vibration sensors. The security device may also include means for detecting tampering with the computer, which may be arranged to detect removal of the computer casing.

The security device preferably includes means for raising an alarm. This may, for example, be an audible sounder device, a visual device such as a light and/or means for activating a remote warning device such as a burglar alarm or for alerting security staff.

The security device preferably includes an internal power supply, such as a rechargeable battery. The device may also be arranged to be powered by the computer's power supply and preferably includes means for detecting when that supply is interrupted.

The security device is preferably arranged to provide a warning signal, should the computer be moved accidentally. Advantageously, the warning signal is arranged to stop automatically if there is no further movement of the computer.

Preferably, the security device includes a swept frequency audible alarm. The alarm is thus able to take advantage of the resonant cavity frequencies of the computer casing and the room in which the computer is located to increase the

apparent loudness of the alarm.

The security device preferably includes means for deactivating the device, for example using a key switch, by
5 entering a code on the computer keyboard or by sensing power on.

The security device preferably includes means for physically securing it to the computer. This may, for
10 example, consist of an element that is arranged to extend through an aperture in the computer casing and receive a locking device to prevent the element being withdrawn from the aperture. The locking device preferably allows peripheral components of the computer, such as the keyboard
15 and the monitor, to be secured to the base unit of the computer. The locking device may also allow the base unit to be secured to a desk or other fixed object.

According to the present invention there is further
20 provided a computer including a security device as described in the preceding paragraphs. The security device may be included on one of the standard components of the computer. For example, the security device may be included on one of the printed circuit boards of the
25 computer. The security device may be arranged to be activated or deactivated by entering a code on the computer keyboard.

The present invention yet further provides a printed
30 circuit board for a computer, the printed circuit board including a security device comprising a control element and means for connecting the control element to a movement detection means, a tampering detection means and an alarm means, the control element being arranged to activate the
35 alarm means if movement or tampering is detected.

The board may be a motherboard, a video card, a main memory

board, a software accelerator board, a disc controller or any other standard printed circuit board of a computer.

5 An embodiment of the invention will now be described, by way of example, with reference to the accompanying drawings, of which:

Fig. 1 is a front view of the security device;

10 Fig. 2 is an end view of the security device;

Fig. 3 is a side view of a mounting bracket;

Fig. 4 is a rear view of the mounting bracket;

15

Fig. 5 is a top view of the mounting bracket;

Fig. 6 is a block diagram of an electronic circuit, and

20 Fig. 7 is a schematic circuit diagram of the electronic circuit.

As shown in Figs. 1 and 2, the security device comprises an electronic circuit indicated generally by reference No. 1
25 and a mounting bracket indicated generally by reference No. 2..

The electronic circuit 1 is mounted on a printed circuit board (PCB) 4 having an edge connector 6 that is designed
30 to fit into an expansion slot of the computer. The edge connector 6 includes contacts 7 for connection to the power supply terminals of the expansion slot. The entire printed circuit board and the electronic components mounted on it
(with the exception of the edge connector 6) may be
35 embedded in a solid block of resin or plastics material, to protect them against physical damage.

The mounting bracket 2, which is shown in more detail in Figs. 3 to 5, is formed from sheet metal and is shaped to fit a standard access port in the side or rear of a computer casing. The mounting bracket comprises a plate 10, the upper end portion 11 of which is bent outwards substantially perpendicularly to the plane of the major portion of the plate. A flange 12 is provided on one edge of the plate 10 and is bent inwards substantially perpendicularly to the plane of the plate. The electronic circuit 1 is secured to the flange 1, for example by means of rivets. A slot 14 is provided in the upper end portion 11 and the lower end portion 15 of the plate 10 is tapered for attachment to the computer casing in a conventional manner.

15

An electrical switch lock 18 is mounted in an aperture 19 in the plate 10 and is connected electrically to the electronic circuit 1. A key (not shown) is used to arm and disarm the device using the lock 18, as will be described later. Alternatively, a panel number lock that requires the entry of a particular code number may be provided.

A steel pin 20 having a transverse aperture 21 in one end is securely attached to the plate 10 and extends outwards perpendicularly thereto. The pin 20 is arranged so that, when the edge connector 6 is fitted in an expansion slot of the computer, the pin extends outwards through an access port of the computer. The shank of a padlock (not shown) may be inserted through the aperture 21, to prevent the device being removed from the computer.

The padlock may also be used to secure the peripheral components of the computer, such as the monitor and the keyboard, to the base unit by passing the leads of those components through the shank of the padlock. This prevents the components being removed (at least without cutting the leads) and also makes it much more difficult to steal the

computer as it is very awkward to carry the base unit with the monitor and the keyboard still attached.

The electronic circuit is shown in Figs. 6 and 7 and
5 includes a logic circuit 25 comprising a series of electronic switches. Connected to the logic circuit 25 are the electrical switch lock 18, a vibration detector 26 and a tamper circuit 27. The vibration detector 26 comprises a pair of tilt switches mounted with their axes horizontal
10 and orthogonal to one another. Alternatively, a device that senses components of acceleration along one or more axes may be provided. The vibration detector 26 is designed to sense when the computer is moved from a static position on a desk.

15 The tamper circuit 27 comprises a micro switch 27a that is positioned in mechanical contact with the casing of the computer and arranged to detect removal of the casing. Alternatively, the tamper circuit may detect removal of the
20 casing by other means, for example by using optical, acoustic, ultrasonic, magnetic or electrical sensors.

Also connected to the logic circuit 25 are a reset timer 28, the purpose of which will be described later, and a
25 swept tone generator 29. The swept tone generator 29 comprises a sweep generator 29a and a tone generator 29b and is connected to a sounder device 30, for example a piezoelectric acoustic transducer. The swept tone generator 29 is capable of driving the sounder device 30 at
30 two output levels, for example a low level of about 60dB and a high level of about 120dB.

The swept tone generator 29 is arranged to generate a rapidly fluctuating swept frequency output with, for
35 example, the frequency sweeping between 150Hz and 1500Hz three or four times per second. This ensures that the output of the sounder device passes through the resonant

frequencies of the computer casing and the room in which it is located, so producing an apparent increase in the volume of the alarm.

5 The electronic circuit 1 also includes a rechargeable battery 32 that is recharged continuously from the computer power supply through the contacts 7, whenever the computer is switched on. The battery has a sufficient capacity to sound the alarm continuously for approximately 5-6 hours or
10 longer.

The logic circuit 25 includes a voltage sensor 34, which senses when the computer power supply is connected. If the computer power supply is disconnected, for example by
15 removing the plug from the mains electricity supply, the logic circuit 25 switches automatically to the battery power supply 32, which has sufficient capacity to maintain the device in the active, quiet state for up to a year. Should the battery become completely discharged, when the
20 computer power supply is restored the device automatically enters the active, quiet state (unless the electrical switch lock 18 is in the off position).

Operation of the electronic circuit will now be described.
25 The circuit is activated by means of the electrical switch lock 18. When the switch is in the off position, the alarm will not sound under any circumstances. This allows an authorised person to gain access to the interior of the computer casing for maintenance purposes and also permits
30 the security device to be fitted or removed as necessary. Normally, however, the switch 18 will be in the on position, so that the security device is activated.

When the security device is active, if the computer casing
35 is removed this is detected by the micro switch 27a and the tamper circuit 27 sends a signal to the logic circuit 25. Upon receipt of this signal, the logic circuit 25 sends a

signal to the tone generator 29, which drives the sounder device 30 at the high output level, so raising the alarm. Replacing the computer casing does not stop the alarm, which continues to sound until either the battery 32 is
5 exhausted or, optionally, the security device is automatically reset by a timer device 36 after a predetermined interval.

An authorised person can silence the alarm by using the key
10 to switch the device off using the electrical switch lock 18. When switched on again, the security device is automatically reset and placed in the active, quiet state.

The vibration detector 26 works in conjunction with the
15 computer power supply sensor 34. If the computer power supply is present (i.e. if the computer is connected to the mains), the logic circuit 25 disregards any signals received from the vibration detector 26. This ensures that the alarm is not sounded should the computer be moved or
20 knocked during normal use.

If the computer power supply is disconnected, the logic circuit 25 becomes sensitive to any signals received from the vibration detector 26. If any vibration or movement of
25 the computer is detected, the vibration sensor 26 sends a signal to the logic circuit 25, which sends a first signal to the swept tone generator 29 causing the tone generator to drive the sounder device 30 at the low output level.

30 A signal is sent simultaneously by the logic circuit 25 to the reset timer 28, which after a predetermined interval (for example, 45 seconds) sends a signal back to the logic circuit 25. Upon receipt of that signal, the logic circuit 25 sends a second signal to the swept tone generator 29
35 causing the swept tone generator to drive the sounder device 30 at the high output level.

The low level output of the sounder device 30 serves as warning to the person who has moved the computer that the full alarm is about to sound. If, during the interval determined by the reset timer 28, there is no further movement of the computer or if the mains power supply is restored, the logic circuit 25 sends a third signal to the swept tone generator 29, which silences the sounder device 30. The security device is simultaneously reset to the active, quiet state. However, should further movement be detected with the mains supply disconnected, the full alarm will sound upon expiry of the predetermined interval.

The security device may also be reset to the active, quiet state by means of the electrical switch lock 18.

The purpose of the two-stage operation of the vibration detector is to ensure that the alarm is not set off accidentally, for example by cleaning staff. Thus, if the computer is knocked or moved whilst the mains supply is disconnected, the security device will emit a warning signal but will not sound the full alarm unless further movement is detected. The warning signal will stop after the predetermined interval or can be silenced by reconnecting the computer to the mains electricity supply.

Various modifications of the security device are possible. For example, instead of or in addition to an audible alarm, the device may include a visible alarm such as a light. The device may also be arranged to activate an external warning device such as an intruder alarm, for example by means of a radio transmission, or to alert a security guard. Furthermore, the device may be arranged to disable the computer, to make it worthless to the thief.

Instead of or in addition to the padlock, the device may include a hawser or wire that is electrically connected to the electronic circuit. In use, the wire is wrapped around

the cables of the peripheral components of the computer such as the monitor and the keyboard and plugged into a connection socket on the circuit board. If the wire is broken or disconnected, this is sensed and the logic
5 circuit sounds the alarm.

In a further embodiment of the invention, the security device is built into one of the standard components of the computer. For example, the device may be incorporated on
10 the motherboard, the video card, the main memory board, the software accelerator board, the disc controller or any other printed circuit board or other component of the computer. In this case, the electronic circuit will usually be contained in a single semiconductor chip.

15 The rechargeable battery 32, the vibration detector 26, the microswitch 27a and the sounder device 30 may be located on the printed circuit board or the board may include connections to one or more of those components.
20 Optionally, the computer's standard backup battery may be used to power the device and the computer's loudspeaker may be used as the sounder device, particularly if it is a high output loudspeaker.

25 Instead of having an electrical switch lock, the security device may be armed or disarmed by entering a code on the computer keyboard.

Claims

- 5 1. A security device for a computer, the security device including a control element and, connected thereto, means for detecting movement of the computer, means for detecting tampering with the computer and means for raising an alarm, the control element being arranged to activate the alarm
10 means if movement or tampering is detected.
2. A security device according to claim 1, in which the means for detecting tampering is arranged to sense removal of at least a portion of the computer casing.
15
3. A security device according to claim 1 or claim 2, in which the means for detecting movement is arranged to sense vibration and/or tilting of the computer.
- 20 4. A security device according to any one of the preceding claims, in which the means for raising an alarm comprises an audible alarm device.
5. A security device according to claim 4, in which the
25 alarm device is arranged to produce a swept frequency audible output.
6. A security device according to any one of the preceding claims including means for detecting connection
30 of the computer to a mains electricity supply.
7. A security device according to claim 6, in which the mains detecting means is connected to the control element and the control element is arranged to disregard any
35 detected movement of the computer whilst the mains supply is connected.

8. A security device according to claim 6 or claim 7, in which the control element is arranged to activate the alarm means if tampering is detected, regardless of whether or not the mains supply is connected.

5

9. A security device according to any one of the preceding claims, in which the control element includes a timer device that is arranged to start timing upon detection of computer movement, the control element being
10 arranged to stop the alarm device after a predetermined timed interval providing that no further movement is detected during that interval.

10. A security device according to any one of the
15 preceding claims, including means for deactivating the security device.

11. A security device according to any one of the preceding claims, the device being arranged to be housed
20 within the computer casing.

12. A security device according to claim 11, including a locking device to prevent unauthorised removal of the device from the computer casing.

25

13. A security device according to claim 12, in which the locking device is arranged to permit peripheral computer components to be locked to the device.

30 14. A security device according to claim 13, including means, connected to the control element, for detecting removal of the peripheral computer components.

15. A security device according to any one of the
35 preceding claims, in which the device is arranged to receive electrical power from the power supply of the computer.

16. A security device according to claim 15, in which the device is arranged to fit into an expansion slot of the computer.

5 17. A security device according to any one of the preceding claims, including a rechargeable electrical power supply.

18. A security device for a computer, the device being
10 substantially as described herein with reference to, and as illustrated by, the accompanying drawings.

19. A computer including a security device according to any one of the preceding claims.

15

20. A computer according to claim 19, wherein the security device is included on one the standard components of the computer.

20 21. A computer according to claim 20, wherein the security device is included on one of the printed circuit boards of the computer.

22. A computer according to claim 21, wherein the security
25 device is arranged to be activated or deactivated by entering a code on the computer keyboard.

23. A printed circuit board for a computer, the printed circuit board including a security device comprising a
30 control element and means for connecting the control element to a movement detection means, a tampering detection means and an alarm means, the control element being arranged to activate the alarm means if movement or tampering is detected.

35

24. A printed circuit board according to claim 23, wherein the board is a motherboard, a video card, a main memory

board, a software accelerator board, a disc controller or any other standard printed circuit board of a computer.

25. A printed circuit board according to claim 23 or claim
5 24, wherein the security device is arranged to be activated or deactivated by entering a code on the computer keyboard.



The
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Application No: GB 9514679.1
Claims searched: 1-25

Examiner: David Summerhayes
Date of search: 12 August 1996

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.O): G4N (NAT1, NCM, NCSE, NPPXA1)

Int Cl (Ed.6): G08B (13/00, 13/02, 13/08, 13/14)

Other:

Documents considered to be relevant:

Category	Identity of document and relevant passage	Relevant to claims
X	GB2292629A (MANGALL)	1-25
X	GB2285703A (WEBB)	1-6, 9-17, 19-25
X	US5317304 (CHOI)	1-8, 10, 11, 15-17, 19-25
X	US4686514 (LIPTAK)	1-8, 10

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